

Information Bulletin

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Title: Legacy Configuration of Plutonium Finishing Plant Filter Rooms Provides Potential Leak Path for Unfiltered Radiological Release

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Identifier: 2006-RL-HNF-0019

Lessons Learned Summary: In February of 2006 at the Plutonium Finishing Plant it was discovered that unfiltered ventilation could be released to the atmosphere due to inadequate HEPA filtration system configuration. A supply fan, designed to maintain a positive pressure around the HEPA filter seals through a common ventilation duct, was taken out of service in 1994. With this fan secured, a potential existed for contaminated air to leak past the installed HEPA filter seals into a common duct bypassing the final HEPA filtration process.

Discussion of Activities: The PFP Documented Safety Analysis requires all exhaust air from the radiological zones in 242-Z and 234-5Z be passed through at least one set of HEPA filters. This is accomplished by the use of Filter Rooms 309 to 316 and 318 located on the second floor of 234-5Z as the exhaust air is pulled through exhaust fans, and exhausted out the 291-Z-1 stack. The filter rooms consist of banks of HEPA filters in frames that divide the room into an inlet and outlet side. The HEPA filter frames have rubber gaskets on the inlet and outlet sides. Additionally, the PFP filter rooms are surrounded by a common annulus air space between the gaskets, filter, and filter frame.

The air space between the HEPA filter seals had previously been maintained under positive pressure by a supply air fan (S-10). A supply header ducted air through dampers to each filter room. The positive pressure was to prevent unfiltered (contaminated) air from bypassing the seals if they fail. PFP management isolated power to the S-10 fan in 1994.

When the fan was taken out of service testing was performed on each filter room to analyze the aerosol test results with the dampers closed against the previous successful test results (dampers open). Additionally, all filter room gaskets are replaced as part of the filter replacement. Based on these actions, the filter room design was considered adequate with the S-10 supply fan out of service. Additionally, long-term corrective actions were taken to ensure the test results were valid by modifying the HEPA aerosol testing procedures to close the S-1A duct room damper, and to minimize the potential for gasket failure by replacing filter room gaskets during any filter change-out or if an aerosol test failed.

All filter room aerosol testing procedures were revised to state: "MILLWRIGHT CLOSE S-10 filter room inlet damper (d-XX-25a) by disconnecting damper linkage" to allow the dampers to close and ensure integrity of the aerosol injection test of the HEPA filters by subjecting them to the maximum negative pressure available from the building exhaust fans. Also, steps were taken to change out the filter room gaskets every time a HEPA filter bank was replaced, or if the filter room failed the aerosol injection test. These actions were identified in Occurrence Report DP-RL-WHC-PFP-1994-0050 "Negative pressure on the supply duct to filter rooms

resulted in declaration of potentially inoperable HEPA filters".

Analysis: During a review of a HEPA filter room aerosol test in early February 2006, the validity of the test was questioned as it related to the configuration of the damper (the damper was disconnected, but the damper did not move). As a result, the HVAC Design Authority conducted an evaluation of the configuration and determined that because S-10 is out of service and the filter rooms share a supply duct header (S-1A), a potential leak path for unfiltered air could occur as negative pressure could exist in the S-1A supply duct. A leak path between filter rooms could occur if an inlet gasket seal were to leak from one filter room (allowing contaminated air to enter the annulus), and an outlet gasket seal were to leak in a different filter room (allowing the air to escape unfiltered). The filter bypass route could result in failure to identify a failed filter inlet side seal during aerosol challenge.

It was discovered that unfiltered ventilation could be released to the atmosphere as a result of the shutdown of a supply fan. The supply fan was designed to maintain a positive pressure around the HEPA filter seals through a common ventilation duct. With this fan out of service a potential existed for contaminated air to leak past the installed HEPA filter seals into the common duct bypassing the final HEPA filtration process.

Recommendations:

- System configuration changes must be fully evaluated and documented to ensure any changes address all potential impacts to the system performance (operation, maintenance, abnormal conditions) and that proper controls have been put in place. This is especially important for vital safety systems.
- When performing procedure steps (and during validation of these steps), it is essential that the intent of the step be met when the action is taken. The use of the Stop Think Act Respond principle can aid in recognizing these types of procedure deficiencies.

Cost Savings/Avoidance: Not determined

Work Function: Inspection and Testing

Hazards: Radiological release

Keywords: HEPA filter, seals, PFP, vital safety systems

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References: EM-RL--PHMC-PFP-2006-0004 "Question whether legacy configuration of the Bldg 234-5Z E-3 & E-4 filter rooms provides a potential leak path for unfiltered release (USQ)"

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